

05/22/00
JCS90 U.S. PTO

Patent
Attorney's Docket No. 032326-025

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

UTILITY PATENT
APPLICATION TRANSMITTAL LETTER

JCS11 U.S. PTO
09/576412
05/22/00

Box PATENT APPLICATION

Assistant Commissioner for Patents
Washington, D.C. 20231

Sir:

Enclosed for filing is the utility patent application of Gilles LISIMAOUE for Process to Manage Data in a Chip Card.

Also enclosed are:

- ☒ 2 sheet(s) of ☒ formal ☐ informal drawing(s);
- ☒ a claim for foreign priority under 35 U.S.C. §§ 119 and/or 365 is ☐ hereby made to filed in on ;
☒ in the declaration;
- ☐ a certified copy of the priority document;
- ☐ a General Authorization for Petitions for Extensions of Time and Payment of Fees;
- ☐ statement(s) claiming small entity status;
- ☐ an Assignment document;
- ☒ an Information Disclosure Statement; and
- ☒ Other: Preliminary Examination Report for PCT/FR98/02510.
- ☒ An ☐ executed ☒ unexecuted declaration of the inventor(s)
☒ also is enclosed ☐ will follow.
- ☐ Please amend the specification by inserting before the first line the sentence --This application claims priority under 35 U.S.C. §§119 and/or 365 to filed in on ; the entire content of which is hereby incorporated by reference.--



21839

☐ A bibliographic data entry sheet is enclosed.

☒ The filing fee has been calculated as follows ☐ and in accordance with the enclosed preliminary amendment:

C L A I M S					
	NO. OF CLAIMS		EXTRA CLAIMS	RATE	FEE
Basic Application Fee					\$690.00 (101)
Total Claims	13	MINUS 20 =	-0-	x \$18.00 (103)	-0-
Independent Claims	1	MINUS 3 =	-0-	x \$78.00 (102)	-0-
If multiple dependent claims are presented, add \$260.00 (104)					-0-
Total Application Fee					690.00
If verified Statement claiming small entity status is enclosed, subtract 50% of Total Application Fee					-0-
Add Assignment Recording Fee if Assignment document is enclosed					-0-
TOTAL APPLICATION FEE DUE					690.00

☐ This application is being filed without a filing fee. Issuance of a Notice to File Missing Parts of Application is respectfully requested.

☒ A check in the amount of \$ 690.00 is enclosed for the fee due.

☐ Charge \$ _____ to Deposit Account No. 02-4800 for the fee due.

☒ The Commissioner is hereby authorized to charge any appropriate fees under 37 C.F.R. §§ 1.16, 1.17 and 1.21 that may be required by this paper, and to credit any overpayment, to Deposit Account No. 02-4800. This paper is submitted in duplicate.


Please address all correspondence concerning the present application to:

James A. LaBarre
Burns, Doane, Swecker & Mathis, L.L.P.
P.O. Box 1404
Alexandria, Virginia 22313-1404.

Respectfully submitted,

BURNS, DOANE, SWECKER & MATHIS, L.L.P.

Date: May 22, 2000

By: 
James A. LaBarre
Registration No. 28,632

P.O. Box 1404
Alexandria, Virginia 22313-1404
(703) 836-6620

PROCESS TO MANAGE DATA IN A CHIP CARD

This disclosure is based upon, and claims priority from, French Application No. 97/14802, filed November 25, 1997 and International Application No. PCT/FR98/02510, filed November 24, 1998, the contents of which are incorporated
5 herein by reference.

Field of the Invention

The aim of this invention is a process to manage data stored in a chip card. The invention concerns the transfer of data from one card to another, particularly in the case where the original card is on the point of expiry and has to be replaced by a
10 card with extended duration and also having similar system options, the same data recorded in the electronic circuit.

Background of the Invention

Thus for example electronic purses are already known in the field of chip cards, or more generally portable equipment with a computer chip. In such uses
15 monetary units stored in the memory of a chip card are transferred to another and withdrawn from the first. There is on the face of it no limit to validity. Also in the banking sector chip cards, the card body of which is clearly embossed with the expiry date of the card, are known. This precaution of limiting the validity of the card has two objectives. On the one hand it allows the age of the electronic circuits
20 to be taken into account and to facilitate its replacement. On the other hand it gives rise to the return of the cards in circulation to the supervisory body in such a way that this body can totally control the means which it makes available to carry out transactions.

With the exponential development of applications controlled by uses of the
25 chip card, expired chip cards may no longer need to be replaced by a supervisory body: it ought to be possible to do this on site, if necessary with common chip card readers/recorders.

The principles of using chip cards include the requirement to compose a secret code or personal identity number (PIN) and comparison of this code with a code stored in the memory of the chip. If this comparison is successful, the application i.e. in practical terms goods or services corresponding to the transaction can be obtained, or even a payment can be effected with the card. If not the case a reject situation is indicated to the carrier. This comparison is implemented in a fail-safe manner.

The problem which occurs when the requirement is to transfer data from one card to another is a problem of managing these secret codes or, more generally, management codes which allow management under the control of data stored in the memory of the cards. In fact these codes stored in one form or another in the memory of the chip card are produced by the supervisory body according to data capable of identifying the card and particular to this body. As a result it is impossible to arrange the automatic extension of the validity of the cards by replacing expired cards with cards with longer memory without the intervention of this body. Indeed such an operation would amount to disclosing all the secrets concerning the formulation of the secret codes and particular to this body to all the other organizations or even all the readers capable of arranging this extension.

However the aim of the invention is to remedy this future problem by instituting a recording procedure for the management codes. The procedure takes into account the previous management codes or at least data relating to the old cards from which the data are to be recorded into the new originates.

Summary of the Invention

According to the invention a cryptographic algorithm is used to produce a new management code which on the one hand takes into account identification data of the new card and on the other hand information relating to the old card. In a particular case the data relating to the old card will be the identification data of the

old card. In another case the management code of the old card itself will be used.
Any other data relating to the old card can be used.

At the moment of use the user can be asked to compose a secret code which corresponds to the management code of the second card. In certain cases of special
5 verification he can also be asked to compose, in a second stage or first stage, a secret code corresponding to the management code of the first card in order to check the coherence of the formulation of the second management code.

Therefore the aim of the invention is a process to manage data stored in a first memory of a first chip of a first chip card in which:

10 A first management code is produced with a first cryptographic algorithm based on a mother key and a first set of identification data of the first chip card.

This first management code is recorded in the first memory,

- The first card is inserted into a chip card reader, and

- Editing of the data stored in the first memory is authorized if a code
15 presented to the reader is compatible with the first management code recorded. The invention is characterized in that

- A second management code is produced with a second cryptographic algorithm based on data relating to the first card and a second set of identification data of a second chip card,

20 - This data relating to the first card and this second management code is recorded in a second memory of a second chip of the second chip card, and

- Editing of the data stored in the second memory is authorized if a secret code presented to the reader is compatible with the second management code recorded.

Brief Description of the Drawings

The invention will be better understood after reading the description below and after examining the figures which accompany it. The latter are only given as a guide and in no way limit the invention. The figures are detailed as follows:

- 5 Figure 1: a diagrammatic illustration of a device which can be used to implement the process of the invention;
- Figure 2: essential stages for implementing the process of the invention;
- Figure 3: preferred method to check the legality of the holding of a chip card by a carrier; and
- 10 Figure 4: diagrammatic illustration of a symmetric-type algorithm enabling a management code to be found from a previous management code.

Detailed Description

- Figure 1 shows a device which can be used to implement the process of managing data according to the invention. This figure shows a reader 1 to read
- 15 portable equipment 2 with a chip card or a chip card inserted in a slot 3 of the reader. This reader, in a conventional way, has a screen 4 to display messages written by the reader and a key-pad 5 to allow an operator, the carrier of the card, to arrange a transaction between reader 1 and chip card 2. In an example the reader can be linked by various means to a master system 6, either in real or delayed time.
- 20 In an example these means can include a radio link using two antennas 7 and 8 and their associated transmission/reception system, linked to the reader and master system respectively.

- The invention concerns more particularly the transfer of data contained in an expired chip card 9 (its expiry date being for example 1996, already out-of-date) and
- 25 a new chip card 2 with a much later expiry date (2007). Card 9 as well as card 2 each contain a computer chip, such as that referenced 10, and means of linking up with reader 1. In an example these means of linking up with the reader are quite simply a connector 11. Other solutions of linking up are known. In Figure 2 the

stages of the process of the invention are shown in a more detailed way. The old chip card 9 and the new chip card 2 are both illustrated. The chip card contains data 12 recorded in a memory of the chip, representing a serial number of the card or chip. In a banking application this serial number can also be or correspond to a bank account number.

The principle of formulating a management code consists of using a mother key 100. A mother key is thus a chain of binary characters: in an example a mother key has a length of 1024 bits. The serial number of the card or the chip can also be presented in binary form. The two chains of corresponding binary characters are then presented to a cryptographic algorithm represented symbolically by reference 13. Cryptographic algorithm 13 results in the production of a first management code. In an example cryptographic algorithm 13 is implemented by the master system, available at an issuer of the card, before this issuer decides to send the chip card to its user. In the course of a procedure known as personalisation, the issuer reads the serial number of the card with a special chip card reader and produces a first management code 14 with an algorithm 13 and a mother key 100 known by the issuer alone. The master system records the first management code 14 in the memory of the chip of the card. In a known way this can be recorded in a place of the chip of card 9. This place can also depend for its position on the application, first application 27, controllable with the card. Preferably the management codes are therefore secret and stored in places which cannot be violated.

Figure 3 shows a preferred method for using a chip card or portable equipment with a chip equipped for an application such as a management code 14. When an operator, a user, inserts his chip card into reader 1, the latter produces a random chain of bits 15. This random chain of bits 15 is sent especially by means of connector 11 to chip card 9. The latter then starts to encrypt the random chain of bits 15 by the management code 14 and produces a management code 16 encrypted by the random chain of bits. At the same time the operator composes a secret code on keypad 5. This secret code is sent to reader 1. Reader 1, in the same way as card

9, produces the encryption 17 of the secret code by the value of the random chain of bits 15 which this reader knows. A comparison circuit 18 of the reader unless the latter is a comparison circuit 19 of the card, compares the management code 16 encrypted by the random chain of bits with secret code 17 encrypted by the random chain of bits. If this is identical the result of the comparison circuit 18 or 19 will be positive and the progress of the transaction planned with card 9 can continue.

Notably this progress of transactions will include editing the data stored in the first memory of the first card 9 if the secret code presented to the reader is compatible with the first management code 14 recorded.

In fact the reader will on the one hand often produce a ticket 20 representing the transaction or on the other hand in a non-obvious way make a record in its memory to represent this transaction. This record is itself intended to be transmitted to the master system in delayed mode or in real time.

Ticket 20 as well as the record will include details of the transaction, notably at least a way of identifying chip card 2, for example serial number 12 envisaged up till now, or an account number or any other information recorded in card 9. The sole fact that this information appears on ticket 20 or on the record of reader 1 signifies that it has also been edited. In practical terms an attempt is made in fact with the comparison to prevent or allow such editing and therefore the continuation of the transaction.

In the invention it has been considered that a card 9 was concerned and transferring the contents of chip 10 of this card 9 into a chip of a new card 2 was wanted. According to the invention a second management code 22 is produced with an algorithm 21, based on data relating to card 9 and a set of identification data of the second card 2.

In a particular example the information relating to the first card is rightly the serial number 12 and the information relating to the second card 9 is equally a serial number 23 of this second card. However the first management code 14 or any other information could be used as data relating to the first card.

In the invention algorithm 21 is implemented by a common-type reader 1 but equipped with software for the purpose, during a session to produce code 22, of reading useful data in card 9, requesting extraction of card 9 and putting into place card 2 as a replacement, reading useful identification data in card 2, calculating code
5 22 and recording it in card 2. To simplify such production of management codes, the software for implementing the algorithm can, at least partly, be stored in card 9 (or in card 2). It can even be implemented by the micro-processor of the card for greater security.

To simplify the explanation it was considered that algorithm 21 needed to
10 receive three chains of characters. Algorithm 13 preferably will receive the first serial number 12, a second time the first serial number 12 as well as mother key 100. In an example algorithm 21 is the same as algorithm 13. For algorithm 21 the three items of useful data can be serial number 23, serial number 12 and mother key 100. This key 100 can even be replaced by code 14. Therefore according to the
15 invention a second management code 22 is produced with the second cryptographic algorithm 21. The second management code 22 produced in this way is then recorded in the second card 2 at the same time as the data relating to the first card (12 or 14) which has served to formulate this second management code. In the example serial number 12 of the first card 9 is also recorded in the second card 2.

Figure 2 shows again that the mechanism can be extended from the time
20 when a third chip card 24 equipped with a third serial number 25 is used. Then it will be possible with this third card 24 to produce a third management code 26 under the same conditions with an algorithm 27 similar to algorithm 21. In this case the data relating to the second card 2: serial number 23 will be stored in the memory
25 of the third card 24. However it is also possible to want to store data relating to the first card 9, i.e. serial number 12 in the third card 24.

A first application 27 has been illustrated for card 9. This application is an initial way to use card 9. This card 9 according to the invention can preferably be a multi-application card. In this case management code 14 is a management code

intended for one application. For other applications 28 or 29 the same items will be found. Nevertheless while the same serial number 12 (common to the whole card or whole chip) can be used, the other management codes will benefit from being different. This can easily be achieved by using algorithms 13 programmed by different mother keys 100, depending on the applications concerned. Mother key 100 can also be stored in card 9 in the place of the memory zone reserved for applications 27, 28 or 29. Algorithm 13 is then programmed by a key 100 which depends on the application.

As soon as it is confirmed that the carrier of card 2 is a good carrier, reader 1 and chip card 2 exchange information as shown in Figure 2. In this case however the management code concerned is now code 22 relating to the second card and no longer code 14 relating to the first. The operator must therefore compose a secret code corresponding to code 22.

It is possible according to the invention to check that the second card 2 is a legitimate successor for the contents of the first card 9. This check can be made on request by having reader 1, or alternatively chip card 2, execute corresponding encryption operations, on the one hand, by algorithm 13 and on the other hand by algorithms 16 and 17. The operator must therefore compose a secret code corresponding to code 22. In other words, based on the first serial number 14 available in the second card 2, it is possible - conforming to the information given for the top of Figure 2 - to again find the first management code 14. Then, provided with this management code 14, card 2 can implement algorithm 16 from the random chain of bits. In this case the carrier can be asked to compose not the new secret code but the old secret code. In an example the request to carry out this more complex check could be requested at random, for example on average once every hundred times. Clearly if the check fails the same consequences on the continuation of the transaction will occur.

Algorithm 21 will preferably be different from algorithm 13, although it could be the same. If it is different algorithm 21 will preferably be an algorithm

known as symmetric. A symmetric algorithm 31 is shown on Figure 4. The peculiarity of a symmetric algorithm is the use of CPu public keys paired with CPt private keys. The symmetrical character of algorithm 31 then results in the fact that data 30 ciphered in symmetric algorithm 31 by mother key 32 produce encrypted data 33. If these data 33 are themselves encrypted by the same programmed algorithm 31, then by daughter key 34, then the second implementation of algorithm 31 produces source data 30. In an example it is possible to have several different CPt private daughter keys for the same CPu public mother key. Diversification of the keys involves the intervention of the serial number of the cards so that each card possesses a key, a different management code 14. It is clear that if algorithm 13 or algorithm 21 are symmetric algorithms and if data 30 are replaced by serial number 12 then the daughter key 34 itself is obtained as encrypted data.

According to the invention in addition to the data stored in the memory of card 9, a transmission attribute is associated. And editing of these data is authorized notably to allow them to be copied into the second memory, depending on the value of this attribute. If this is the case these data are copied into the second chip card 2 at the same time as this attribute. In practice this attribute gives information about a need to produce a second management code or not when the data are copied. In certain cases the mechanism implemented by algorithms 13 and 21 will be required; in other cases it will not be executed.

In another case the transmission attribute gives information about the need to control data copying by the master system. In this case when the data to be copied is edited, the attribute concerning these is read. If intervention by the master system is required, a connection to master system 6 is made. This data copying can then take place in real or delayed time with or without the data being transmitted to the master system.

CLAIMS

1. Process to manage data stored in a first memory of a first chip of a first chip card in which:

a first management code is produced with a first cryptographic algorithm based on a mother key and a first set of identification data of the first chip card,

this first management code is recorded in the first memory, the first card is linked to a chip card reader, and editing of data stored in the first memory is authorized if a secret code presented to the reader is compatible with the first management code recorded, wherein the following steps are performed:

a second management code is produced with a second cryptographic algorithm based on data relating to the first card and a second set of identification data of a second chip card,

these data relating to the first card and the second management code are recorded in a second memory of a second chip of the second chip card, and editing of the data stored in the second memory is authorized if a secret code presented to the reader is compatible with the second management code recorded.

2. The process according to claim 1 wherein the first and second management codes are secret codes.

3. The process according to claim 1 wherein the second algorithm is implemented in the chip of the card.

4. The process according to claim 1 wherein the first cryptographic algorithm is different from the second cryptographic algorithm, and the second cryptographic algorithm is symmetric.

5 5. The process according to claim 1, wherein the first cryptographic algorithm is the same as the second cryptographic algorithm.

6. The process according to claim 1, wherein the data relating to the first card is the first set of identification data of the first card or the first chip.

7. The process according to claim 1, the data relating to the first card is
10 the first management code of the first card or the first chip.

8. The process according to claim 1 wherein a management code word is produced in the reader on the basis of the data relating to the first card, and a determination is made whether the card is authentic if this second management code word is compatible with a secret word.

15 9. The process according to claim 1 wherein a transmission attribute is associated with the data stored in the first memory, editing of these data is authorized so that they can be copied into the second memory depending on the value of this attribute, these data and this attribute are copied into the second memory, and this attribute gives information about a need to produce a second
20 secret code when copying the data.

10. The process according to claim 9 wherein, in order to authorize editing of data contained in the first memory only under the control of a master system, a transmission attribute which gives information about a need for this

control by a master system is associated, this attribute is read prior to editing, and an editing program is started if the attribute having been read allows this.

11. The process according to claim 9 wherein the transmission attribute inhibits editing with a view to the data concerned being copied.

5 12. The process according to claim 9 wherein the data is copied into the memory in delayed time.

13. The process according to claim 1, wherein the card is a multi-application card, the data being associated with respective management codes.

ABSTRACT

The invention concerns a method for duplicating data contained a smart card memory in the memory of another smart card, which consists in producing for said other card another management code, another secret code. Said other management
5 code is produced on the basis of identification data particular to the first card and also particular to the second card. For the system to operate, identification data concerning the first card are also recorded in the second card.

1/2

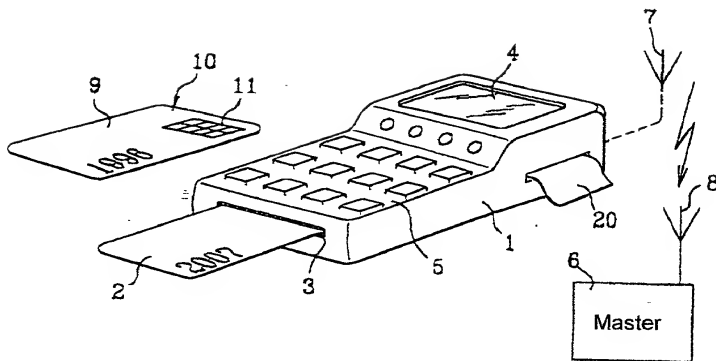


FIG. 1

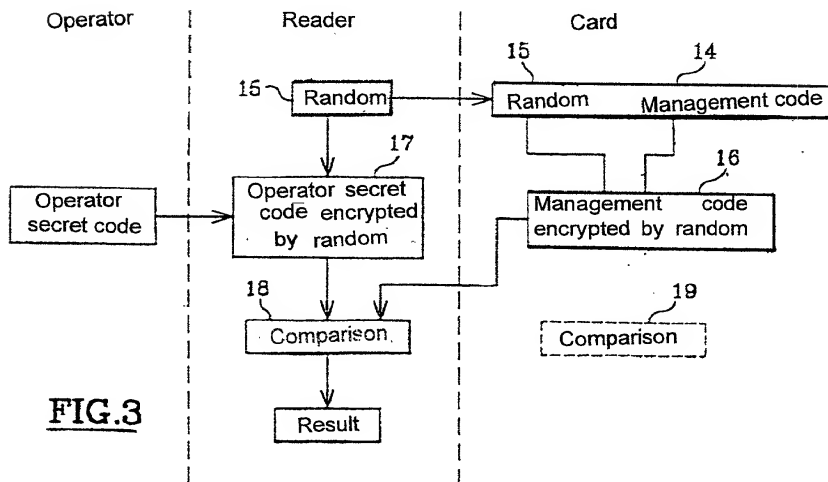
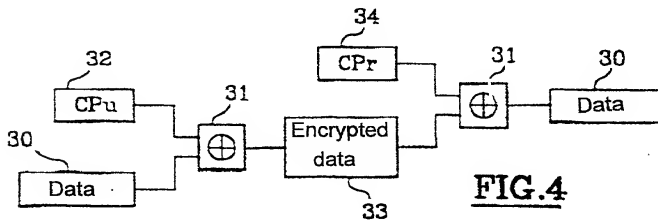
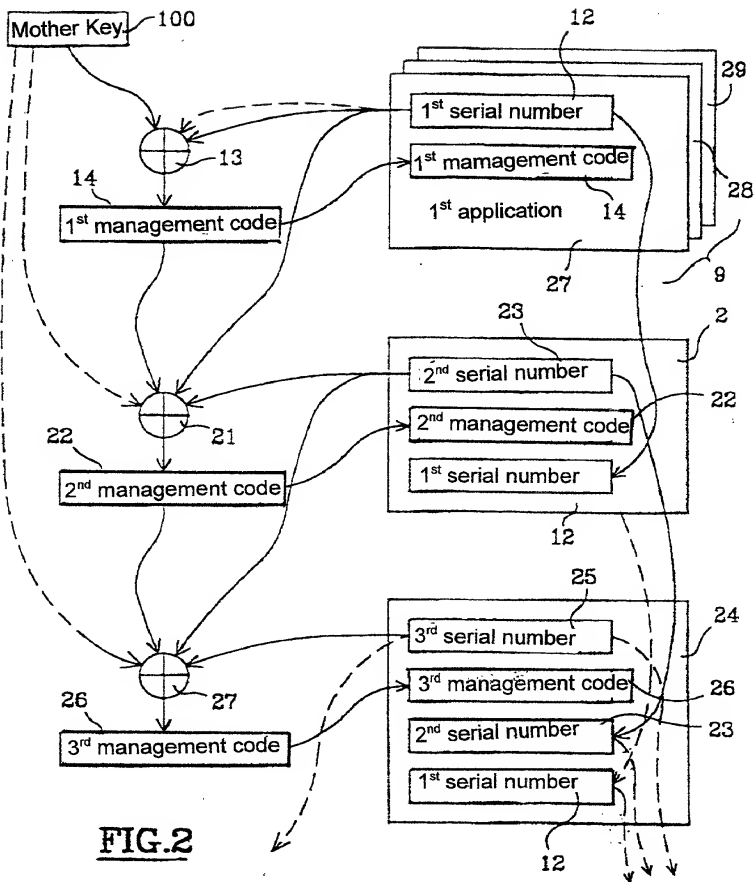


FIG. 3

2/2



COMBINED DECLARATION FOR PATENT APPLICATION AND POWER OF ATTORNEY
(Includes Reference to Provisional and PCT International Applications)

Attorney's Docket No.

032326-025

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name;
I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

Process to Manage Data in a Chip Card

the specification of which (check only one item below):

☒ is attached hereto.

☐ was filed as United States application

Number _____

on _____

and was amended

on _____ (if applicable).

☐ was filed as PCT international application

Number _____

on _____

and was amended

on _____ (if applicable).

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose to the Office all information known to me to be material to patentability as defined in Title 37, Code of Federal Regulations, §1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, §119 (a)-(e) of any foreign application(s) for patent or inventor's certificate or of any PCT international application(s) designating at least one country other than the United States of America listed below and have also identified below any foreign application(s) for patent or inventor's certificate or any PCT international application(s) designating at least one country other than the United States of America filed by me on the same subject matter having a filing date before that of the application(s) of which priority is claimed:

PRIOR FOREIGN/PCT APPLICATION(S) AND ANY PRIORITY CLAIMS UNDER 35 U.S.C. §119:

COUNTRY (if PCT, indicate "PCT")	APPLICATION NUMBER	DATE OF FILING (day, month, year)	PRIORITY CLAIMED UNDER 35 U.S.C. §119
France	97/14802	November 25, 1997	<u>X</u> Yes <u> </u> No
			<u> </u> Yes <u> </u> No
			<u> </u> Yes <u> </u> No
			<u> </u> Yes <u> </u> No
			<u> </u> Yes <u> </u> No

I hereby claim the benefit under Title 35, United States Code § 119(e) of any United States provisional application(s) listed below.

(Application Number)

(Filing Date)

(Application Number)

(Filing Date)

COMBINED DECLARATION FOR PATENT APPLICATION AND POWER OF ATTORNEY (CONT'D)
(Includes Reference to Provisional and PCT International Applications)

Attorney's Docket No.

032326-025

I hereby claim the benefit under Title 35, United States Code, §120 of any United States application(s) or PCT international application(s) designating the United States of America that is/are listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in that/those prior application(s) in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose to the Office all information known to me to be material to the patentability as defined in Title 37, Code of Federal Regulations §1.56, which became available between the filing date of the prior application(s) and the national or PCT international filing date of this application:

PRIOR U.S. APPLICATIONS OR PCT INTERNATIONAL APPLICATIONS DESIGNATING THE U.S. FOR BENEFIT UNDER 35 U.S.C. §120:

U.S. APPLICATIONS		STATUS (check one)		
U.S. APPLICATION NUMBER	U.S. FILING DATE	PATENTED	PENDING	ABANDONED
PCT APPLICATIONS DESIGNATING THE U.S.				
PCT APPLICATION NO.	PCT FILING DATE	U.S. APPLICATION NUMBERS ASSIGNED (if any)		
PCT/FR98/02510	24 November 1998		X	

I hereby appoint the following attorneys and agent(s) to prosecute said application and to transact all business in the Patent and Trademark Office connected therewith and to file, prosecute and to transact all business in connection with international applications directed to said invention:

William L. Mathis	17,337	R. Danny Huntington	27,903	Gerald F. Swiss	30,113
Robert S. Swecker	19,885	Eric H. Weisblatt	30,505	Michael J. Ure	33,089
Platon N. Mandros	22,124	James W. Peterson	26,057	Charles F. Wieland III	33,096
Benton S. Duffett, Jr.	22,030	Teresa Stanek Rea	30,427	Bruce T. Wieder	33,815
Norman H. Stepno	22,716	Robert E. Krebs	25,885	Todd R. Walters	34,040
Ronald L. Grudziecki	24,970	William C. Rowland	30,888	Ronni S. Jillions	31,979
Frederick G. Michaud, Jr.	26,003	T. Gene Dillahunty	25,423	Harold R. Brown III	36,341
Alan E. Kopecki	25,813	Patrick C. Keane	32,858	Allen R. Baum	36,086
Regis E. Slutter	26,999	Bruce J. Boggs, Jr.	32,344	Steven M. du Bois	35,023
Samuel C. Miller, III	27,360	William H. Benz	25,952	Brian P. O'Shaughnessy	32,747
Robert G. Mukai	28,531	Peter K. Skiff	31,917	Kenneth B. Leffler	36,075
George A. Hovanec, Jr.	28,223	Richard J. McGrath	29,195	Fred W. Hathaway	32,236
James A. LaBarre	28,632	Matthew L. Schneider	32,814		
E. Joseph Gess	28,510	Michael G. Savage	32,596		



21839

and: _____

Address all correspondence to:



21839

James A. LaBarre
BURNS, DOANE, SWECKER & MATHIS, L.L.P.
P.O. Box 1404
Alexandria, Virginia 22313-1404

Address all telephone calls to: James A. LaBarre at (703) 836-6620.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

COMBINED DECLARATION FOR PATENT APPLICATION AND POWER OF ATTORNEY (CONT'D)
(Includes Reference to Provisional and PCT International Applications)

Attorney's Docket No.

032326-025

FULL NAME OF SOLE OR FIRST INVENTOR		SIGNATURE	DATE
Gilles LISIMAQUE			
RESIDENCE		CITIZENSHIP	
1508 Blue Meadow Road, Potomac, Maryland 20854, United States of America		France	
POST OFFICE ADDRESS			
1508 Blue Meadow Road, Potomac, Maryland 20854, United States of America			
FULL NAME OF SECOND JOINT INVENTOR, IF ANY		SIGNATURE	DATE
RESIDENCE		CITIZENSHIP	
POST OFFICE ADDRESS			
FULL NAME OF THIRD JOINT INVENTOR, IF ANY		SIGNATURE	DATE
RESIDENCE		CITIZENSHIP	
POST OFFICE ADDRESS			
FULL NAME OF FOURTH JOINT INVENTOR, IF ANY		SIGNATURE	DATE
RESIDENCE		CITIZENSHIP	
POST OFFICE ADDRESS			
FULL NAME OF FIFTH JOINT INVENTOR, IF ANY		SIGNATURE	DATE
RESIDENCE		CITIZENSHIP	
POST OFFICE ADDRESS			
FULL NAME OF SIXTH JOINT INVENTOR, IF ANY		SIGNATURE	DATE
RESIDENCE		CITIZENSHIP	
POST OFFICE ADDRESS			
FULL NAME OF SEVENTH JOINT INVENTOR, IF ANY		SIGNATURE	DATE
RESIDENCE		CITIZENSHIP	
POST OFFICE ADDRESS			
FULL NAME OF EIGHTH JOINT INVENTOR, IF ANY		SIGNATURE	DATE
RESIDENCE		CITIZENSHIP	
POST OFFICE ADDRESS			